

Remarks

Claim 4 was rejected as indefinite. Applicant requests reconsideration. The claim has been accordingly amended.

Claim 1 and 2 were rejected as anticipated Ho. Claims 3, 4, 5, 8, 9, 10, 11, 19, and 20 were rejected as unpatentable over Ho in view of prior art. Claims 6, 7, and 12-18 were objected to as having allowable subject matter based rejected base claims. Applicant requests reconsideration.

It is apparent that the examination has confused claimed features with features found in Ho. To aid the examination in realizing the patentable differences, the old term "decoding" in the independent claims has been replaced with "demodulating", and old "demodulating" term in the claims has been deleted, so that the examination does not continue to confuse unrelated elements of the invention and that of Ho.

The original claim 1 use the term "demodulating" to reference the downconversion process that occurs when demodulating a carrier upon reception. In the transmitter, the phase modulated signal is upconverted from a baseband frequency to a high RF frequency for efficient transmission. The transmitted signal is then downconverted during reception from the high RF frequency back down to the baseband frequency. This is very well known art. The reference to the baseband signal now only appears in dependent claim 3 along with the reference to up conversion and down

1 conversion. As such, claim 1 no longer uses the term
2 "demodulation".

3
4 The original claim 2 used the term decoding, as in Viterbi
5 decoding algorithms, are commonly used for "demodulating" a
6 sequence of sampled inputs from the filtered continuous phase
7 modulated signal. The primary reference, upon which the examiner
8 relies, uses the term "Viterbi demodulator", which is a specific
9 type of demodulator. Claim 2 and Ho now both use the term
10 "demodulator" for that function, so that, a proper one-to-one
11 comparison can now be clearly understood by the examiner, without
12 confusion.

13
14 Claim 1 and 2 are considered together, as when combined, the
15 original data stream, that is a bit data stream, in the transmitter
16 is regenerated in the receiver as an estimate of the unprecoded
17 data symbols, thereby completing the communication from the
18 transmitter to the receiver. The bit data stream is processed in a
19 series of process steps as claimed in claims 1 and 2, and as now
20 compared, step by step with Ho, so as to remove the examination
21 confusion and miscomparisons.

22
23 The bit data stream is a series of binary digits of zeros and
24 ones. Both the present invention and Ho have an original bit data
25 stream, such as b_k as used in Ho. The bit data stream is symbolized
26 into a series of data symbols. In the case of NRZ 2-ary formatting,
27 for example, the series of 0 and 1 bits are formatted into a series
28 of +1 and -1 data symbols having a symbol set of +1 and -1, for 2-

1 ary modulation. For 4-ary modulation using NRZ mapping, two
2 consecutive bits of 0 and 1 are formatted into a data symbol having
3 the symbol set of +1, -1, +3, and -3. Hence, there is generated a
4 sequence of M-ary data symbols. The M-ary symbols are then precoded
5 in a particular and prescribed manner, as particularly stated in
6 the precoding tables stated in the specification. The precoded
7 symbol set is the same as in an unprecoded symbol set, that is, +1
8 and -1 for 2-ary modulation and +1, -1, +3 and -3 for 4-ary
9 modulation. Ho performs the encoding and precoding functions in the
10 "encoder", and Ho's c_k output is the precoder output. However, the
11 particular precoding selected in Ho is used specifically to inject
12 pilot symbols for channel estimation, and not to remove decoding
13 after demodulation as does the present invention. The encoded data
14 symbols c_k in Ho, along with the injected pilot symbols, are phase
15 modulated using a BT product and transmitted as such.

16
17 Upon reception, the present invention uses a phase amplitude
18 modulation (PAM) based filter bank to provide filtered signals
19 having components that directly indicate the unprecoded, that is,
20 the original data symbols. In contrast, Ho uses an anti-aliasing
21 filter to remove noise. The filter output in Ho does not have
22 signal component that directly indicate the unprecoded data symbols
23 b_k . There is no similarity in these two filtering functions because
24 the respective filters serve two different respective purposes.
25 Although both are referred to as filters, the actual filtering
26 performed and the purposes are clearly unrelated.

27

1 As such, the filter outputs in the present invention are of
2 significant value per se, in that, the filter outputs could be used
3 for directly generating an estimate of the unprecoded data symbols
4 using one of many forms of Viterbi demodulation with various levels
5 of complexity and resulting performance. With a sufficiently large
6 BT product, the output of a signal filter, for example, the
7 principal filter, can be used to directly provide reliable
8 estimates of the unprecoded data stream.

9
10 The filter output is sampled at the symbol time boundaries in
11 both Ho and the present invention. The demodulator in the present
12 invention DIRECTLY provides the estimated unprecoded symbols, that
13 is, the uncoded data symbols, whereas the demodulator in Ho only
14 provides an estimate of the encoded data symbols, which must then
15 be DECODED to arrive at the estimate of the uncoded data symbols.
16 As such, the examination must now recognize that Ho does not use a
17 precoder for eliminating the decoding step in the receiver, as does
18 the present invention. Clearly, the invention is directly contrary
19 to Ho's teachings. Ho does not address the very problem that the
20 present invention solves. Ho cannot possibly use a precoder as in
21 the present invention to solve the problem of avoiding the final
22 decoding step in the receiver.

23
24 Ho does teach the use of a Viterbi demodulator, but such
25 demodulators have long been used. In the case of small BT products
26 and high-order M-ary modulation, Viterbi demodulation is often used
27 to mitigate the degrading effect of intersymbol interference, that
28 is typically shown in eye diagrams having poorly defined detection

1 levels in the constellation signal space. However, and as an
2 example, in the case of 2-ary communications with a relatively
3 large BT product and where the output of the principal filter is
4 sampled at symbol boundaries, a simple comparison of the sampled
5 principal filter outputs to a zero threshold value could be used as
6 a demodulator of the unprecoded data symbols. That is, the
7 demodulator could be a simple thresholding device. The choice of
8 demodulator addresses the selected BT value and system BER
9 performance in the presence of channel noise, and is not
10 determinative as to the innovative structure and functions of the
11 invention. Hence, claim 1 does not specify the exact type of
12 demodulator used, as the focus of the invention is directed to the
13 use of a precoder for use with a corresponding filter providing a
14 phase indicating the unprecoded data symbol, so that, post-
15 demodulation decoding is not needed.

16
17 The present invention precodes data in a continuous phase
18 modulator in combination with and matched to a filter for providing
19 a filtered output having a phase that directly relates to the
20 unprecoded data, so as to avoid the need for decoding in the
21 receiver. Ho's use of precoding for injecting pilot symbols is
22 irrelevant. Ho's use of an anti-aliasing filter is irrelevant, as
23 well. But, Ho is a good prior art example of demonstrating the need
24 for decoding in the receiver after demodulation, as Ho never
25 addresses the problem of eliminating this decoding, as Ho teaches
26 that this decoding "undoes" the encoding that was done in the
27 modulator, and Ho specifically teaches that "The output of the
28 demodulator 18, is sent to a decoder 20, which undoes the mapping

1 done by the encoder 10." The object of the precoding in the present
2 invention is to remove the need for decoding after the demodulator,
3 and as such, the present invention proceeds directly contrary to
4 Ho, as Ho is strong evidence of nonobviousness.

5
6 The cited references do not teach precoding in a continuous
7 phase modulator for recovering from a matched filter a data stream,
8 without post demodulation decoding. Allowance of the claims is
9 requested.

10
11 Respectfully Submitted

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15 CERTIFICATE OF MAILING

16
17 I, hereby certify that this correspondence is being deposited
18 in the United States Postal Service in an envelope with First Class
19 full postal prepaid thereon addressed to: Commissioner of Patent,
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